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East Europe Report

ECONOMIC AND INDUSTRIAL AFFAIRS

(FOUO 4/81)

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CONTENTS

CEMA COOPERATION IN AGRICULTURAL SCIENCE, TECHNOLOGY 1981-85

Bratislava EKONOMIKA POLNOHOSPODARSTVA in Czech No 1 Jan 81 pp 6-8

[Article by Eng Petr Samek, Federal Ministry of Agriculture and Nutrition: "International Scientific Technological Cooperation in Agriculture in 1981-1985"]

[Text] Scientific technological cooperation represent an important factor in scientific technological development. When targeted on vital areas of research, it may accelerate it distinctly.

During the current 1981-1985 period, multilateral and bilateral scientific technological cooperation will deal with tasks for which prorgams and operational plans for that 5-year period are now in the planning stage. Nevertheless, it is not enough to include only tasks in the plans for cooperation; forms must be sought that may enhance the obligatory character of cooperation among partners and thus, guarantee efficiency, which in turn helps achieve the planned targets in the solution of the tasks stipulated in the national plans of the socialist states and of the CSSR. The advantage of cooperation for the scientific technological development of the CEMA member states is, therefore, determined by the degree of its intensification, i.e., by the forms in which the cooperation is carried out.

Coordinated Solution of Tasks in Research

The most widespread form of multilateral scientific technological cooperation is coordinated solution of research and development tasks. It is implemented on the basis of plans for coordination of scientific technological and technical research compiled by appropriate CEMA echelons. Individual organizations of the CEMA member states coordinate the research and development programs according to the agreed-upon topics, usually on the basis of division of labor among the participating organizations, one of which is appointed to act as the principal coordinator of that particular study.

With the participation of the organizations jointly solving a problem, the principal coordinating organization arranges drafting of the proposals for the operational plan on the basis of teh plan for scientific technological cooperation; submits it for approval to the directors of the cooperating organizations; offers all necessary assistance in drafting proposals for agreements (contracts)

and other documents required for the operational plan; proposes, jointly with the organizations involved in joint solution of the problem, measures necessary for the fulfillment of the operational plan; arranges exchange of information among the cooperating organizations concerning programs related to that particular subject and conducted by the CEMA member states and, if possible, also by other states; prepares relevant documentation and organizes consultations on scientific coordination; prepares, together with the organizations involved in joint solution of the progress of research programs as concerns the topic in question. Furthermore, it issues comprehensive annual reports on the progress and results of the research and development programs for individual topics on the basis of information provided by the organizations engaged in joint solution of the problem, including scientific technological conclusions pertaining to the application of the results of completed programs, and presents them to the organizations involved in joint solution of the problem and to the CEMA secretariat.

The permanent CEMA commission for agriculture appointed two scientific technoolgical councils to resolve complex problems in the plan for cooperation, namely, problems of "Improvement of Methods of Developing More Prolific Strains, Seed Propagation, and Development of More Prolific Types of Fodder" and "Gathering, Study, Maintenance and Utilization of World Resources of Cultivated and Wild Plants for the Development of More Prolific Strains and Hybrids of Agricultural Crops." CEMA organs appoint the scientific technological councils and also outline their tasks and set up their operational systems.

An indisputable advantage of coordination is in its relatively unrestrained and flexible activity and in the fact that its operational plans are approved directly by the heads of the cooperating organizations. A certain drawback stems from its relatively loose linkage and consequently, from limited responsibility of all cooperating organizations.

Cooperation and Joint Organization of Programs

Cooperation and joint organization of programs represent the prospective forms of international cooperation which particularly enhance its mandatory character. In multilateral scientific technological cooperation, such methods are introduced mainly within the framework of selected problems solved on the basis of signed agreements by which the coordinating centers are also appointed. In terms of cooperation, these methods represent in principle more intensive division of labor, and in terms of jointly conducted programs, they involve concentration of research capacities of the participating countries on research and development programs for the purpose of solving a selected scientific or technological problem.

The agreements on cooperation in research and development programs are exemplified by contracts on agricultural research concerning multilateral cooperation in the solution of selected problems. The agreements were concluded by the appropriate ministries of the CEMA member states. At the same time, the agreements appointed the coordinating centers; the agreements include programs of cooperation and stipulate, among other things that the cooperation be based on operational plans, contracts and other documents concluded by the competent organs of individual states.

A certain disadvantage of most agreements of that kind is that cooperation is linked with adopted programs and operational plans and that the contract does not guarantee any transfer of information concerning the results from completed stages.

The coordinating center is an organ which coordinates planning and cooperation in selected scientific and technological programs. An organization of one of the CEMA states which has appropriate scientific technological bases usually serves in the specific function of the coordinating center.

A council of commissioners is appointed to deal with basic problems in the fulfillment of the agreement and of the program and to supervise general activities of the coordinating center. The council of commissioners discusses and approves further specifications of the program, its changes and amendments, measures pertaining to training and higher qualification of scientific and technological workers relative to the problem under study, and annual plans for the activities of the center. Furthermore, it discusses proposals for the application of the results gained in the studies in connection with the program, and conclusions of analyses and prognoses concerning a particular problem. Meetings of the commissioners ususlly take place once a year. Representatives or organizations participating in the solution of a particular problem are usually nominated to serve as representatives in the council of commissioners. Several actions (consultations of experts, exchange of information, consultations on scientific coordination, study programs, etc.) are organized annually in conjunction with the solution of individual topics of the programs under study in the coordinating center.

Seven multilateral agreements on appointments of pro tem international study groups, representing the above-mentioned form of joint organization of the programs, have been concluded in 1978-1979 to deal with selected topics of programs conducted in certain coordinating centers. These groups are organized in one of the research, development or other organizations of one of the participating states for a specific period in order to undertake specific research or development programs according to the adopted program. The task of the groups is to engage top experts every year in intensive studies of vital problems in research using sophisticated equipment and other facilities for expenditious solutions of specific problems.

A measure stemming from a long-range target program for CEMA cooperation (DCPS) approved in June 1978 at the 32nd session of the CEMA should be mentioned here among progressive methods of international cooperation. Some measures of the program pertaining to economic cooperation made it possible to efficiently correlate scientific technological cooperation with economic cooperation; certain scientific technological problems are represented in some of these measures. The long-range target program for CEMA cooperation set the preconditions for international cooperation in the science-research-production-consumption cycle.

Basic Program for the Next Five Years

"The Plan for Cooperation of the CEMA Member States in Organizing Scientific and Technological Research in the Areas of Agriculture and Forest Economy for the 1981-1985 Period" stipulated the method of coordination in a number of problems

and topics which in cross section represent parts of that plan, namely:

--soil and improvement of its fertility;

--plant production (including development of higher yeilding strains, seed propagation, agrotechnology, technology of cultivation, etc.);

--plant protection;

--livestock production;

--veterinary medicine;

--mechanization and electrification of agriculture;

--forest economy;

--economy of agricultural organization and management.

Some of the above-mentioned parts of the plan also include problems which are the subject of the adopted multilateral agreements on whose basis the above-mentioned coordinating centers, and, within the framework of some agreements, pro tem international study groups, have been organized. The following problems will be studied in international cooperation over the next 5-year period:

--Specification of requirements for new complex and other fertilizers, and methods of their effective application and study of their effect on fertility of soils in long-term application. The agreement was concluded on 22 June 1972 and a coordinating center was organized in the scientific technological institute for fertilizers in Leipzig-Potsdam, GDR. A pro tem international study group was organized in that center in the GDR to study the problem of "Determination of Phosphorus Accessible to Plants in Soil."

--Specification of theoretical principles and new methods for the development of higher yeilding strains and seed propagation, development of highly productive, top-quality strains and hybrids of wheat, rye and barley. The agreement was concluded on 19 November 1971 and a coordinating center was organized at the Institute for Plant Development and Genetics in Odessa, USSR. Four pro tem international study groups and one working group have been organized there (again on the basis of a multilateral agreement), namely:

--study of correlation between the energy system and the productivity of various genetic types of wheat and barley, and study of potential application of the ascertained methods for expeditious assessment of productivity (the agreement was concluded in 1975 and a study group organized in the GDR);

--elaboration of methods and preparation of initial documentation for the development of highly productive strains of wheat, barley and amphidiploids with higher protein contents and improved amino acid composition (agreement concluded in 1975, a study group organized in the USSR);

—study of genetic, physiological and biochemical principles of resistance, and specification of a general theory for the development of wheat and barley strains resistant to rust and blight (agreement concluded in November 1977, a study group organized in the Bulgarian People's Republic);

--an agreement concerning a group to study the same problem was concluded in 1978; a working group was organized at the Institute for the Research of Vegetable Production in Prague-Ruzyne to study the problem in terms of soil and clmatic conditions for wheat and barley cultivation in the northwestern zone of the CEMA member states;

—utilization of plant explanates in the development of high-yielding grain crops (agreement concluded in October 1979 and a study group organized at the Institute for Experimental Botany of the Czechoslovak Academy of Sciences in Prague, research station in Olomouc).

--An agreement will be signed in 1981 and a coordinating center organized at the Research Center for Agriculture of the Hungarian Academy of Sciences, Martoavasar, to study the problem of developing high-yielding high-quality corn strains and hybrids, planning and implementation of highly efficient industrial methods of its cultivation.

--Study of new types of pesticides, development of biological and other methods of plant protection, and comprehensive study of the effect of protective agents on the environment. Agreement concluded on 28 April 1971 and the coordinating center organized at the Institute for Plant Protection in Poznan, Polish People's Republic.

—Study of basic biological problems in industrial livestock production. The agreement was concluded on 22 June 1972 and the coordinating center organized at the Scientific Technological Research Institute of Livestock Production in Dummerstorf-Rostock, GDR. Pro tem international study groups organized there deal with the following issues:

--transplantation of ova in horned cattle (agreement concluded in 1975, a study group organized in the GDR);

--application of nonprotein nitrogenous agents for more efficient supply of nitrogen compounds to reminants (agreement concluded in 1978, a study group organized in the Research Institute for Animal Husbandry in Nitra).

—Development of methods for prophylaxis and effective fight against the hoof and mouth disease and development of highly effective vaccines against that disease. Agreement concluded on 20 December 1974 and a coordinating center organized at the All-Union Scientific Technological Institute for the Research of the Hoof and Moutn Disease in Vladimir, USSR.

--Mechanization, electrification and automation of operations in plant and livestock production. Agreement concluded on 18 January 1972 and a coordinating center organized in the Research Institute for Agricultural Technology in Prague-Repy.

--Comprehensive automation of operations in forestry. Agreement concluded on 19 November 1974 and a coordinating center organized at the All-Union Scientific Institute for the Research of Forestry and Mechanization of Forest Economy in Puskino, USSR.

--Elaboration and introduction of mathematical methods and computer technology in agriculture. Agreement concluded on 19 November 1971 and a coordinating center organized at the VUEZVz in Prague.

Bilateral Cooperation

As for bilateral scientific technological cooperation, the programs for scientific technological cooperation concluded with individual partner states include the most essential problem of agricultureal science and technology. The main target of bilateral scientific technological cooperation is implementation of the results and information gained in multilateral cooperation and their application in the conditions of individual states which have concluded an agreement on bilateral solution of such problems.

A form of coordination within the bilateral scientific technological cooperation may be mentioned here. In view of fewer cooperating organizations, no principal organization is usually selected and the solution of the problem must be coordinated jointly by those organizations of both states which share the most in the solution of the problem.

At present, organizations jointly solving problems are in the process of preparing and approving 5-year operational plans on each topic of programs for scientific technological cooperation. The partner states agreed to maintain the required standards when drafting such operational plans primarily in terms of distinct division of labor, specific stages of the research programs, terms of their solution, etc. Such operational plans will constitute a basis for subsequent contracts for cooperative or joint solutions of selected tasks in such cooperation and for integrating the scientific technological cooperation in the economic cooperation. According to the previously signed agreement on the appointment of two pro tem international study groups, the program will continue to deal with the "Solution of the System of Problems in Technology of Cultivation, Harvesting and Postharvest Treatment and Development of New Strains of Hops." One of the study groups is focusing on the problems of mechanization of hops cultivation (CSSR) and the other on the development of new strains of hops (USSR).

Agreements will be concluded for scientific technological cooperation with the GDR on a study concerning cooperation in the solution of problems related to mechanization, meliorization and agricultural transportation.

This is a brief outline of the forms of scientific technological cooperation which may decisively help improve its efficiency. Some other forms of cooperation, such as exchange of information, consultations of experts, conferences, and symposis, are not described here.

More intensive scientific technological cooperation will result in economic cooperation and prepare the ground for efficient joint implementation of the achieved results in the production.

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EXPERTS ANALYZE CSSR ENERGY SITUATION

Power Production in Sixth Five-Year Plan

Prague ENERGETIKA in Slovak No 12, 1980 pp 525-526

[Article by Eng Milan Ruzniak, candidate of sciences, CSSR deputy minister of fuels and power]

[Text] By implementing the conclusions of the CPCZ congress in the area of fuels and power during the Sixth Five-Year Plan we took a programmed approach to resolving the consequences of the new situation which arose in 1974 in the world markets for oil, gas, energy and raw materials in general. We focused on slowing the growth of oil consumption, increasing domestic sources of fossil fuels and nuclear power, and increasing import of natural gas and its thrifty utilization. We are implementing these goals step by step. We have increased domestic output of brown coal for power production during the Sixth Five-Year Plan by about 10 million tons. The annual increase in oil consumption will be only about half that in the Fifth Five-Year Plan. In cooperation with the Soviet Union we have put the 30 MW V-1 nuclear power plant in Jaslovske Bohunice into operation, along with a total of about 4,400 MW of new capacity in electric and thermal power stations. The socialist countries' joint project, the construction of the Soyuz gas pipeline in the Soviet Union, was completed, and the system of transit gas pipelines was finished, which assured us of a considerable increase in deliveries of natural gas, particularly in the last years of this five-year plan. All of these are unquestionably positive results by which, in keeping with the directives of the 15th party congress, we are creating the conditions in the fuels and energy area for further development of the economy.

The assignments for thrift in the use of fuel and energy resources were not met. Even though domestic consumption of primary energy sources in 1980 will be 3-4 tons of standard fuel lower than specified by the Sixth Five-Year Plan, because of the slower growth of national income more energy will be consumed per unit of national income than was called for. This attests to the fact that the trend in the average annual decrease in consumption of primary energy sources per unit of national income is unsatisfactory.

In this respect we are not satisfactorily fulfilling the main strategic task of the 15th party congress, namely efficient development of the national economy.

The size of savings of fuel and electrical energy and the extent to which they are utilized in the entire reproduction process have thus far been unsatisfactory.

During the first years of the Sixth Five-Year Plan the power industry managed, by consistent implementation of conservation measures, to provide electric power at a level which enabled socialist organizations to fulfill their plan tasks uniformly and to meet the requirements of the populace without interruption.

But there was an important disruption of supply at the beginning of 1979. Because conservation and regulation measures were not developed in time and at the proper level, at the end of 1978 there was a significant drop in power stations' coal supplies.

This fact, together with extraordinary climatic conditions that resulted in limited deliveries of coal to the power stations, led to disruption of electrical supply and of the pace of goal-directed production. Owing to concentrated efforts on the part of party and state organizations to assure in support of the views and conclusions issued by the CPCZ Central Committee Presidium and the CSSR Government on 22 June 1979 regarding the approach to resolving the fuel and energy situation, it was possible to achieve a turnaround in conservation and in the expansion of coal supplies. The area regulations were rescinded and starting in March 1979 the smooth supply of electric power was renewed.

In the last 2 years, a more active approach to rational use of electricity has begun to be brought more to bear among large and small purchasers of electricity, and in combination with the adoption of economic stimuli, a decrease in total consumption of electrical energy about 8 billion kilowatt-hours lower than the figure specified in the Sixth Five-Year Plan was achieved in 1980. However, a significant proportion of this decrease was accounted for by failure to achieve the assigned pace of creation of national income.

If we evaluate the results achieved over the entire Sixth Five-Year Plan, the power production plan for nuclear power plants will prove to have been slightly overfulfilled, the production plan for hydroelectric stations will have been underfulfilled by 0.5 billion kilowatt-hours, and the production plan for steam-powered electric power stations will have been underfulfilled by almost 6 billion kilowatt-hours. Plants' power stations are also failing to fulfill the production target for the entire five-year plan, falling short by about 5 billion kilowatt-hours. Consumption by large-scale consumers will be 1.5 billion kWh higher for the five-year plan, resulting from the faster pace of consumption in the first 3 years and from a transfer of some of the medium size consumers to the category of large consumers during the five-year plan. Consumption by small-scale consumers will be almost 11 billion kilowatt-hours lower than called for in the Sixth Five-Year Plan.

During the Sixth Five-Year Plan electrical and thermal power plants with a total capacity of 4,400 MW were put into operation, including 470 MW of carryover from the Fifth Five-Year Plan. The construction of the Detmarovice, Navoky IV, Pocerady II, Chvaletice, Liptovska Mara and Dalesice power plants and of the first nuclear power plant using VVER power production 440 blocks in Jaslovske

Bohunice were completed. The construction of a 500 MW block in the Melnik III electric power station is in the concluding stage, the startup of the first block of the Prunerov II electric power station, built with Polish supply capacities, and of the first stage of the Cierny Vah pumped storage power station are imminent, and construction of additional nuclear power stations with VVER 440 blocks in Jaslovske Bohunice and Dukovany has begun.

A bottleneck throughout the five-year plan was the transformer capacities of the transmission system, with a high breakdown rate for the 400/100 kV transformers. At the end of the Sixth Five-Year Plan the situation was resolved by emergency import of this equipment from the Soviet Union and capitalist countries.

The Czechoslovak electrication system was integrated into the 750 kV supply system by means of two 400 kV lines to Hungary. Other 400 kV transmission lines strengthened international connections with Poland and East Germany, so that the transmission capacity of intercountry lines was more than doubled, reaching 6,000 MW.

Even though in comparison with the Fifth Five-Year Plan there was an increase in investment in the construction and renovation of electrical distribution networks and facilities, their current status does not meet the requirements for reliable provision of electric power of the requisite quality and there remains a high percentage of outmoded and malfunctioning equipment. There was a slight improvement with regard to voltage drops and losses in the networks, which were decreased from 9.5 to 9.4 percent of usable deliveries. There continues to be a shortage of reliable power distribution components and equipment and of modern equipment for preventive maintenance and for rapid elimination of breakdowns.

By implementing the program for reconstruction and renovation of basic power generation facilities, especially boiler equipment, which was made possible by effective cooperation between the machine building, metallurgical, electrical engineering, construction and power industries, it was possible to decrease the breakdown rate from 6.5-6 percent to less than 5 percent in the last years of the Sixth Five-Year Plan and to decrease the total downtime from 33 percent to 25 percent of the output achieved by steam-powered electric power stations.

The concept of maintenance of power station blocks, which involve securing electric power delivery with backup units of 100 MW or more by machine building organizations using a higher-level supply approach, has been gradually implemented so that the power industry's own repair and machine building capacities will be able to carry out repair of public power stations and thermal power stations with individual block capacities less than 100 mW.

During the Sixth Five-Year Plan the program of expanding centralized provision of hea was continued, while the use of high-quality fuels and high-quality coal sources was concentrated on the solution of the most important problems in Prague, Bratislava and the North Bohemian Kraj. Major heat station capacities were built and put into operation, although frequently with shortfalls in Otrokovice, Koscie, Liberec, Bratislava, Ceske Budejovice, Teplice, Zilina, Prerov

and other cities. Programs to convert electric power stations to heat stations were begun in Komorany, Opatovice and Hodonin. These programs also helped improve air quality, as did stoppage of the operation of the Ervenice II power station. However, fulfillment of the investment construction program for thermal power stations is not completely satisfactory. Some causes are changes in their fuel bases, with a switch from high-quality to lower-quality solid fuels, unsolved problems in site and investor preparation, and nonprovision of supplier capacities by CKD Dukla [Ceskomoravska-Kolben-Danek national enterprise], IBZKG Brno [expansion unknown], Zavody Elektrotechnickeho Strojirenstva [Electrical Engineering Machinery Plants], Inzenirske Premyslovy Stavieb [Industrial Plant Construction Organization], Severocesky Konstruktivy [North Bohemian Design Organization], Hutny Stavby Kosice [Kosice metallurgical construction organization] and others.

As one of the most important consumers of fuel, the power industry must concentrate on thrifty operation of steam-producing facilities as to decrease specific fuel consumption for the production of electric power and heat.

Implementation of the Set of Measures in electrical and heat stations of the Federal Ministry of Fuels and Power led to a decrease of 14 grams of standard fuel per kilowatt-hour consumed in the production of electricity. However, the ministry underfulfilled the assignment of the 15th CPCZ congress by 2 grams of standard fuel per kilowatt-hour. One of the critical reasons was the burning of an increased proportion of lower heat-value or non-categorized types of brown coal.

Through an evaluation of past development and an estimate of future capabilities, we must draw correct conclusions for resolution of the country's fuel and power balance in both the near future and the long term. This requires creative implementation and strengthening of the programmatic solution for this area mapped out in the 15th CPCZ Congress, for the conditions of coming years. This solution is impossible without important structural changes in the production sectors, but primarily in the energy consumption sector.

Procuring fuels and energy will be increasingly demanding, physically difficult, and--in economic terms--more expensive. We took account of these facts during the current [sixth] five-year plan, and the situation will be no easier in the future. This applies to domestic extraction of fuels and production of electricity, and especially to the possibility of providing energy sources through import.

More efficient consumption should be considered the main point of departure for solving the problem of fuel and energy needs. An accelerated pace of achievement of energy conservation in all sectors of the national economy, in the nonproduction area, and in personal consumption offers a decisive potential source for resolving the fuel and energy balance for the future.

Exploitation of New, Secondary Energy Sources

Prague ENERGETIKA in Czech No 12, 1980 pp 551-552

[Article by Eng Bohumil Flemming, CSc, federal minister of technical and investment development: "Use of New and Secondary Energy Sources"]

[Text] With the rapid growth of energy prices, interest in the use of new and secondary energy sources has also increased. It appears, however, that this is not merely a temporary economically-induced phenomenon, but instead that new and secondary sources are being examined as an important alternative for meeting energy needs over the long term.

In particular the use of solar energy both directly (direct conversion of solar energy into electricity, heat or fuel) or indirectly (through energy from the environment, water, wind, biomass and the like) represents a practically inexhaustible source. In addition solar radiation is a type of energy which constantly renews itself and has no negative consequences for the environment. In addition to solar energy, geothermal energy is also available.

However, the new energy sources have certain disadvantages. For example, in the case of solar energy it must be borne in mind that the quantity of solar energy per square meter is relatively small, so that using it requires a large area. In addition, the supply of solar energy is quite nonuniform over time, having daily and annual cycles.

The consequence of these disadvantages, together with unsolved technical problems, is that most of the practical ways of using new energy sources are currently more expansive than use of existing conventional methods or nuclear power. This means, for example, that the greater investments on nonconventional equipment for electricity production are not compensated by savings of electricity over a time period shorter than the life of the equipment.

These problems must, however, be seen in terms of their dynamic development: while expenditures on procuring energy are increasing continuously, thanks to scientific and technical progress and an increasing degree of series production, expenses for equipment to utilize these sources of energy are steadily dropping.

Forecasts of the development of new energy sources differ country by country. In my view, however, we should proceed on the basis of serious estimates that by the year 2000 new types of energy will meet about 3 to 5 percent of energy needs.

The Federal Ministry of Technical and Investment Development has developed a paper on feasible and socially effective use of new and secondary energy sources under the conditions in Czechoslovakia during the Seventh and Eighth Five-Year Plans.

The paper recommends that the following main approaches (measures) and the following scale of energy yields be assumed:

Measure	Energy Yield	
	1985	1990
	[in tons of standard fuel]	
1. Use of solar energy and heat pumps	66,000	175,000
2. Use of geothermal sources in SSR	17,000	73,000
3. Use of waste heat from compressor stations	173,000	284,000
4. Construction of additional stations burning solid municipal and industrial wastes	53,700	271,000
5. Burning of wood waste	113,000	114,000

It is assumed that additional measures will be successfully brought into play, including the production of biogas from pig manure and other wastes. An experiment carried out in Trebon is currently being evaluated, and during the Seventh Five-Year Plan a set of equipment for the purpose is expected to be developed in at least one large scale pig feeding station.

For the present no allowance is made for more extensive use of wind energy, because the annual average wind speed is relatively low in Czechoslovakia. However, arrangements are being made for possible import of units making use of wind energy from the Soviet Union, where such equipment is being developed and produced.

Regarding the individual approaches, it should be stated that in the Seventh Five-Year Plan the use of solar energy and heat pumps will apply primarily to the heating of processing water for agriculture, and to a smaller degree for domestic and civil construction. More extensive use of solar energy for heating in the Seventh Five-Year Plan is not assumed, only experimental work is envisioned.

The following scale of solar equipment construction is assumed:

	1981	1982	1983	1984	1985	1990
Complete facilities using solar energy for water heating (as annual increase in square meters of collector area)	10,000	17,000	35,000	53,000	70,000	200,000
Federal Ministry of Agriculture and Foodstuffs	7,000	12,000	30,000	50,000	60,000	140,000
Construction of solar collectors for drying fodder (square meters)	500	3,000	5,000	10,000	20,000	75,000

Construction of heat exchangers to use biological heat from milk (number of units)	450	450	1,150	1,150	1,150	3,000

The estimates for use of geothermal waters are based on research by the D. Stur Geological Institute in Bratislava. According to this work, about 1,800 MWt is available in geothermal waters. It is assumed that about half of the water can be used advantageously. For the Seventh Five-Year Plan, the use of about 25 MWt is assumed, with the drilling being done both for heating greenhouses in agriculture and for heating processing water and space heating civil and domestic construction.

Specific programs must first be decided on and designs prepared.

In order to use waste heat from the compressors of long-distance gas pipelines, compressor stations are gradually being equipped with heat exchangers which will make it possible to use the waste heat from the gas turbines that drive the compressors, primarily in order to obtain hot water and heat for agricultural purposes. The assumed scale for the Seventh Five-Year Plan will have to be refined as figures on compressor construction are made more specific.

Table 1

	a Opatření	Ni_{mp} b [Kčs/tmp] Ni_e [Kčs/MWh]	c Lhůta splatnosti [roky]	d Druh uspořené energie
e	Využití sluneční energie a tepelných čerpadel	3 900,— 9 650,—	3,5 6,9	elektřina j nafta k
f	Využití geotermální energie	8 400,—	6,5	z. plyn l
g	Využití odp. tepla z kompresorových stanic	4 620,—	3,5	z. plyn l
h	Rozvoj spalování tuhých komunálních a průmyslových odpadů	12 800,— 110,—	7,5 4,0	nafta k centr. teplo m
i	spalování dřevního odpadu	3 300,—	2,0 7,0	nafta k uhlí n

KEY:

a. Measure
b. Ni_{mp} (korunas per ton of standard fuel); Ni_e (korunas per MWh)
c. Payback period (years)
d. Type of energy saved
e. Use of solar energy and heat pumps
f. Use of geothermal energy
g. Use of waste heat from compressor stations
h. Expansion of use of stations burning solid industrial and municipal wastes
i. Burning of wood wastes

j. Electricity
k. Oil
l. Gas
m. Central heat
n. Coal

Construction of stations burning solid [industrial] and municipal wastes during the Seventh Five-Year Plan is expected to include facilities in Banska Bystrica, Brno, Kosice and Opatovice. This would increase the quantity of waste used from the current figure of about 130,000 tons a year to about double that amount in 1985.

In terms of their quantity (about 200 kg per inhabitant per year) and heat capacity (about 6,300 kilojoules per kilogram), solid wastes represent a relatively important source of energy, the use of which is approaching 50 percent in the industrially developed countries.

Currently about 4 percent is being burned in Czechoslovakia; the figure will increase to about 9 percent in 1985. Timely preparation for and commencement of construction of additional stations (Prague, Ostrava, Pizen, Zilina, Nitra and the like) could increase the figure to about 40 percent by 1990.

The burning of wood wastes is planned only until the conditions are created for more suitable use of them, i.e., for the production of chipboard.

A number of preconditions must be realized in order to utilize new and secondary sources of energy.

One of these is the solution of scientific and technical problems in the national and ministerial technical development assignments, involving especially the use of solar and geothermal energy.

The second is provision of the necessary resources for implementation of the projects contemplated. Overall implementation of the entire range of projects will require an expenditure of about 2.5 billion korunas.

In the case of some measures (e.g., the burning of wood wastes), the bottleneck is production of the necessary equipment. A new production sector must be organized to develop the use of solar energy. It is planned that the necessary equipment for solar heating will be produced on a small scale by CKD Dukla [Ceskomoravski-Kolben-Danek] and the production associations, while series production will be introduced in OPS [Okresni Podnik Slvzeb] Kromeriz [District Services Enterprise Kromeriz] (20,000 square meters per year); large series production will be begun in the second half of the five-year plan by the Strojsmalt Bratislava national enterprise where an annual output of about 150,000 square meters will eventually be achieved. A certain range of equipment will be produced by certain other producers (e.g., Koventa Ceska Trebova) and by industry and efficiency improvers using their own resources.

The main stress is laid on production of high quality complete equipment, i.e., not only collectors but heat exchangers, pumps, measuring and regulating equipment and other necessary components.

The measures listed in Table 1 are proposed for implementation in the Seventh Five-Year Plan because they are socially effective projects. With the exception of stations burning solid municipal and industrial wastes and the burning of wood wastes, however, they are projects which are in the development stage, and the outlays to realize them and their energy and economic yields must be estimated.

Typical economic figures expressing the effectiveness of projects are: investment outlays needed to create the possibility of an annual saving of a unit amount of energy (Ni_{mp}, given in korunas per ton of standard fuel, or Ni_e, given in korunas per MWh), and the simple payback period (in years) of the investment outlay by annual energy savings, expressed as social expenditures.

This approach is based on the belief that investments are the decisive factor, since outlays on the use of this type of energy are nil and other operating expenditures are extremely small.

In regard to the table it should be added that the calculations are made on the basis of social expenditures for the individual types of energy.

The period for recovery of investments in acquisition of nonconventional energy sources through annual savings (substitution) of energy can, however, be treated only as an approximate index, which cannot be used in place of comprehensive technical and economic evaluation of projects. However, since this recovery period is considerably shorter than the life of the equipment, this means that the use of nonconventional sources is more beneficial in the case of the type of energy to be conserved (replaced) than the use of conventional sources.

There are still other circumstances which must be taken into account. For example, in the case of the burning of solid wastes no mention was made of another benefit, namely that the burning decreases the volume of the wastes. This is important because it requires an expenditure of from 15 to 170 korunas to dispose of a ton of waste.

Accordingly, evaluations of the effectiveness of individual projects must be made more precise. However, it is apparent that the benefits from using new and secondary energy sources can be operative as early as the Seventh Five-Year Plan, and that their importance will increase steadily. It is also clear that the use of new and secondary energy sources can be operative as early as the Seventh Five-Year Plan, and that their importance will increase steadily. It is also clear that the use of new and secondary energy sources will be particularly advantageous where they replace electricity or liquid or gaseous fuel.

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ENERGY SAVINGS IN CSSR AGRICULTURE, FOOD INDUSTRY CITED

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[Article by Frantisek Stehlik, certified technician, Federal Ministry of Agriculture and Food: "The Energy Conservation Program in the Agriculture and Food Sector"]

[Text] The state program for the rationalization of fuel and energy consumption for the period of the Sixth Five-Year Plan, as approved by the CSSR Government Resolution No 287 of 9 December 1976, established concrete material objectives for individual sectors. In the agriculture and food sector, the concrete objectives for the conservation of fuel and energy during the Sixth Five-Year Plan concerned solely the foodstuffs industry. The results in this sector for the individual years of the Sixth Five-Year Plan were positive, and since the preconditions existed in 1980 for the full assurance of the yearly conservation targets, we may justifiably expect that the material objectives for the conservation of fuel and energy during the Sixth Five-Year Plan for the foodstuffs industry will not only be fulfilled, but exceeded in terms of volume.

But despite the positive results which have been achieved, it is necessary to call attention to certain shortcomings in the fulfillment of this objective. Above all, one must keep in mind that the successful fulfillment of the rationalization objectives is being achieved through many small rationalization projects, without the possibility of the consistent control of their economic contribution, and by means of a very small percentage of specific projects.

Fuel and Energy Situation in Agriculture

The greatest requirements for fuel and energy in agriculture are in the areas of the processing and warehousing of production. The prevention of losses and the preservation of the harvested crops, given the expected increases in yields, require the development of new technological and labor methods which are fuel and energy intensive.

From the viewpoint of the shares of specific types of fuel and energy in the structure of the fuel and energy balance of agriculture, the percentage of enriched fuels, especially crude oil products, will also remain high in the future, while the percentage of solid fuels will remain lower. Moreover, plant production will without doubt remain the most energy intensive, claiming a share of the total energy balance which currently amounts to 80 percent, while the share consumed by livestock production amount to only 20 percent.

Motor fuels (gasoline and diesel fuel), because they are irreplaceable, will continue to form the largest percentage of energy consumption in agriculture.

The influence of the plan of economic and additional instruments on the economical use of motor fuels in agricultural operations in recent years has not corresponded to the requirements for their rational utilization. Shortcomings have occurred both in statistics and in the accounting for motor fuels, both at the branch and the state level.

After the introduction of limited diesel fuel consumption beginning in 1979, accounting has been made gradually more precise, and the overall utilization of this type of energy in agriculture has improved.

Heating oils fulfill the function in agricultural production of an energy source for various forms of heating, both for drying and for climate control. Heavy heating oil (mazut) is at present still being used to a small extent in agricultural operations. Agricultural consumption of light heating oil (LTO) has exceeded 30 percent of total national stocks in recent years, and continues to represent a very complicated problem for central accounting locations.

The guidelines established by the CSSR Government for the future use of heating oils are based on the shortages of these fuels, which inevitably also affect the agricultural sector and make it impossible to cover the high demands for this type of fuel.

At present, heating gas represents the smallest share of energy used in the agricultural sector. This results from the erratic geographical location of distribution pipelines for both coal gas and natural gas, as well as the significant delay in the full gasification of the territory of the CSR.

Greater utilization of coal gas and natural gas for agricultural technology, and especially drying, may not be developed due to low yearly limits for these fuels established by the yearly implementation plans. The current position of accounting centers for heating gases regarding the allocation of deliveries for the summer does not correspond to the practice of recent years. Solid fuels are consumed in agriculture by a relatively large percentage of small-scale consuming installations. Due to the unfavorable situation regarding fuel resources, it is necessary in agriculture as well to maintain the current level of solid fuel consumption. A shortage of suitable consuming installations and a nationwide shortage in classified types of coal and coke are obstacles to the rational consumption of these fuels.

The consumption of electrical energy in agriculture continues to show large increases. The pace of development of consumption of this type of energy in agriculture, like its consumption by the population, is the highest of all the sectors of the national economy. Electrical energy is consumed in stationary technical procedures. Insufficient capacity in the electrical system of the CSSR requires that in agriculture too, electrical energy consumption be suitably directed, especially from the viewpoint of the time of consumption and the necessity for conserving electrical output by optimizing the daily, weekly, and yearly patterns of system loading.

The comprehensive nature of the resolution of the fuel and energy situation requires the immediate inclusion in this balance of nontraditional bearers of fuel and energy as well, particularly secondary energy sources, such as waste heat from the compressor stations of transit gas pipelines, the utilization of sewage gas, biological heat, solar energy, and the like. The share of these energy sources in the total agricultural fuel and energy balance is very low.

The need to replace human labor with technology is an important factor which requires corresponding fuel and energy inputs and thereby additional sources of energy. For instance, in the Seventh Five-Year Plan there is expected to be a decline of 20,000 to 30,000 permanent workers in agriculture whose positions will have to be replaced by technology.

Rationalization in the Use of Fuels and Energy

For the further intensification of these rationalization tasks, and with the goal of incorporating agriculture into the rationalization process, the ministries of agriculture and food of the CSSR, the CSR, and the SSR developed the document "A Conception of Agricultural Energy Policy through 1980 and a Future Projection," which was approved at the beginning of 1979 at a coordinational meeting of the ministers of agriculture and food of the CSSR, the CSR, and the SSR.

"A Conception" contains the fuel and energy balance for agriculture, a solution to the energy requirements of agricultural drying operations, a system of rationalization measures for mobile energy generation, the consumption of electrical energy in agriculture, the scientific and technical development of energy management in agriculture.

An important component of "A Conception" is a set of measures of a short-term and long-term character which are already being gradually implemented and applied, especially in connection with the preparation of a plan proposal for the development of agricultural production for the Seventh Five-Year Plan and its material-technical assurance.

Recently, the ministries of agriculture and food of the CSSR, the CSR, and the SSR completed the application of one of the measures from this set, i.e., the tasks stemming from CSSR Government Resolution No 4/80, concerning the approval of directives for the activity of energy administration units at all management levels. The agriculture and food sectors are also proceeding on the basis of "A Conception of Agricultural Energy Policy through 1980 and a Future Projection" in their assurances of the tasks stemming from CSSR Government Resolution No 240/79, concerning the Long-Term Program for the Rationalization of the Consumption, Conservation, and Utilization of all Types of Fuel and Energy, which established goals for the reduction of the energy intensiveness of the Czechoslovak economy.

This government resolution also decreed the development of individual state fuel and energy programs. For the agricultural and food sector there was Individual Program No 6, "The Rationalization of Consumption and Utilization of Fuel and Energy in Agriculture and the Food Industry (Individual State Target Program (DSCP) No 6). The agriculture and food sector is also affected by DSCP No 1, "Reduction of Losses in the Enrichment, Conversion, and Transportation of Fuel and Energy," particularly in the area of the modernization and redesigning of boilers, and DSCP No 9, "The Utilization of New and Secondary Energy Sources," particularly in connection with the application of solar energy to agricultural technology and the utilization of waste heat from the compressor stations of the transit gas pipeline (KSTP).

The fundamental goal established by DSCP No 6 for the agriculture and food industry of the CSSR is the achievement by 1985 of the conservation of 260,500 tmp [tons of standard fuel], and by 1990 of 563,700 tmp in comparison with 1980 figures. These goals can be achieved by implementing the following specific measures in particular:

--resolving agricultural transport in an optimal manner;

--raising the energy effectiveness of agricultural drying facilities;

--minimizing the working of soil for the raising of grain by the application of technology;

--improved utilization of secondary energy sources in the foodstuff industry.

Concerning the Principal Measures of Individual Fuel and Energy Programs

Agricultural transportation will be the limiting factor in the upcoming period of agricultural mechanization and utilization of second-generation machinery and its combination into production systems. In view of the fact that the agriculture and food sector is one of the largest transporters, transporation alone in this sector is a significant and distinct component of the national transportation system.

To further the assurance of this task, an intersector work team has recently developed a proposal, "A Comprehensive Resolution of Agricultural Factory Production in the Seventh Five-Year Plan and a View to the Future," on the basis of GSSR Government Resolution No 241/79. The projected contribution of this task will be the achievement of a relative reduction in diesel fuel consumption by 1985 of a minimum of 100,000 tons.

The introduction of this comprehensive resolution of agricultural factory transport will guarantee the gradual replacement of tractor transportation with automotive transport, so that by 1985 the percentage of tractor transportation should decline from its current 30 percent level (expressed in terms of ton-kilometers) to 5 percent of the total volume.

A resolution of the 13th session of the CPCZ Central Committee decreed, with a view to the unfavorable condition of agricultural transportation and the need for high national economic efficiency, that during the Seventh Five-Year Plan deliveries should be made of 10,000 specially modified agricultural trucks with more than 8 tons capacity, including trailers and load-bed modifications, and 6,500 loaders corresponding to the needs of agriculture. In agricultural drying, the rationalization program of the ministries of agriculture and food of the CSR and SSR are focusing on the area of drum driers, where there exists a permanently taught relationship between the level of requirements for dried fodder crops and limitations on enriched fuels. The unfavorable condition of heating oil and heating gas supplies in the Seventh Five-Year Plan, as well as the reasons for the supplementary reallocation of fuel bases to agricultural driers, render impossible a continuation of the pace of construction of hot-air drying facilities of the first years of the Sixth Five-Year Plan.

The influence of rationalization measures of a construction character will be only slightly evident in the Seventh Five-Year Plan, because the extent of assurance of the realizational outputs of state task P-19-123-214, "Machine Equipment for the Development of Agricultral Drying Technology" does not make this possible. Furthermore, during the preparation stage of the long-term energy program, the producers of the technology had not consistenly determined the necessary modernization of the conception of agricultural drying in the areas of grains and technical crops, from the viewpoint of energy conservation, for the period of the seventh and eight five-year plans.

Low-temperature dries, the development, manufacture, and delivery of which must be assured by production sectors in the course of the Seventh Five-Year Plan, represent the prepared structural change in energy resources for the agricultural drying of fodder crops. In the organizational rationalization of hot-air drying under the allotted consumption of enriched fuels and electrical energy, strict adherence to "Operational Directives for Drum Driers" will be assumed.

The projected rationalization in the area of drying represents fuel savings in the target year of 1985 of 48,000 tmp fuel, given investment costs of Kcs 1,000 per ton of conserved fuel.

The technique of the minmal working of the soil for grains is, to be sure, a welcome contribution to the rational utilization and conservation of fuel in agriculture, but it must be applied rigorously, according to agrotechnical principles, and according to concrete soil and climatic conditions, i.e., only in the corn and sugar beet production regions, and only on the most arable soils of the potato region. Minimizing technology must be conscientiously integrated into sowing activities so as to assure regular mineral and organic fertilization and soil friability. This means that it may not be applied to the same location every year. It is, therefore, necessary not to overestimate the influence of this measure on the rationalization of fuel consumption in agriculture.

A study by the Prague-Repa Research Institute for Agricultural Technology showed that the investment outlays connected with the projected introduction of minimizing techniques will not exceed the investment outlays needed for traditional working of the soil, despite the fact that the current prices of the sowing machines 40-SEXDJ-150 and 20-SEXDJ-150 are disproportionately high in relation to their performance.

Current plans for the delivery of machinery and equipment during the years of the Seventh Five-Year Plan do not, however, cover the need for machines for minimum soil working. The requirements of the agricultural sector are, therefore, being further asserted in connection with the final stages of completion of a project for the material-technical assurance of agriculture in the Seventh Five-Year Plan.

If proper agrotechnical principles are maintained during minimizing work procedures, then no need is foreseen for increased deliveries of chemical substances for the protection of plants. The new techniques do not place increased demands on energy consumption (either on that needed to produce, or to import, chemical preparations), and the limitation of erosion effects on the soil will improve the environment.

Waste heat from the compressor stations of the transit gas pipeline is obtained from the combustion products of gas turbines, in the form of hot water, by loading the combustion gas exchangers--hot water with an output of 6.45 megawatts into the exhaust manifold of the internal combustion turbines installed at the compressor stations.

After the carrying out and discussion of a number of studies, construction is being implemented of facilities, particularly greenhouses, which utilize this type of waste heat. A new situation in the amount of natural gas being transported from 1981 to 1983, however, will influence the amount of waste heat resources in individual localities. This situation requires, in contrast to the existing intentions, a speeding up of construction realization in the SSR, and more precision in the construction schedule of facilities in the CSR.

Shortcomings caused by the position of the agricultural sector will have to be eliminated by a more active approach by its own scientific research base. For instance, the necessary implementational outputs have not been delivered to investors for the heating of the soil of open, uncovered areas of field vegetables, with the result that it will be impossible to incorporate this trend into Seventh Five-Year Plan projects, even though it is possible to project lower investment demands and greater possibilities for reducing the differences between sources and consumption of the output of waste heat in comparison with greenhouses. It is also necessary to speed up the incorporation of additional progressive techniques utilizing waste heat from the compressor stations of the transit gas pipeline (fish-raising facilities, equipment for the production of protein concentrates, etc.).

In the area of utilizing nontraditional sources, we must achieve a qualitative turnaround in the utilization of solar energy, above all, by switching from an amateur to a professional approach. We esteem highly the work of all innovators and improvers who have attempted to apply solar energy to agriculture, but it is necessary to state that this uncoordinated approach cannot be a conscientious program. The leadership of the Federal Ministry of Agriculture and Food approved, in August 1979, a special set of measures for the development of solar agricultural energy. According to the approved objectives, this program is to depend on deliveries of the necessary equipment from machine building sectors, where mass production is for the present stagnant. The basic conditions for the purchase of a larger amount of equipment for the utilization of solar energy is, however, the high quality and efficiency of this equipment, an acceptable acquisition cost, and a minimum life expectancy of 12 years for complete systems. To aid in the requisite coordination of the resolution of the utilization of nontraditional energy sources, in the assurance of research, development, and production of the necessary equipment, the creation has been approved, based on our proposal, of a working group for nontraditional energy sources under the CSSR Government Commission for the Resolution of Problems Connected with Assuring the Smooth Supplying of the National Economy with Fuel and Energy.

Individual measures included in DSCP Nos 1, 6 and 9 have been agglomerated into a single common "Implementation Program for Rationalizing the Consumption and Utilization of Fuels and Energy in Agriculture and the Foodstuffs Industry", which has recently been submitted, in cooperation with the ministries of agriculture and food of the CSR and the SSR, to the Federal Ministry for Technological and Investment Development, and will be a significant document in the preparation of the Seventh Five-Year Plan, especially from the viewpoint of the investment and material-technical assurance of the relevant rationalization measures in the field of fuel and energy.

According to current projections and intentions, fuel and energy conservation in the agro-foodstuff complex should reach, by the target year of the Seventh Five-Year Plan, a total of 856,000 tmp (CSR, 511,000 tmp: SSR, 345,000 tmp). This level of conservation will necessitate investments in the amount of Kcs 2.7 billion, 1.5 billion of which will be by the CSR Ministry of Agriculture and Food, and 1.2 billion of which will be by the SSR Ministry of Agriculture and Food.

In addition to the identified objectives specifically included in the rationalization program for fuel and energy conservation, the implementation program includes a number of smaller, as yet for the most part unspecified projects in agriculture and the foodstuff industry.

In conclusion, it is necessary to emphasize that the "Rationalization Program for the Conservation of Fuel and Energy in Agriculture and the Foodstuff Industry," which we are preparing for the Seventh Five-Year Plan, assumes the investment and material assurance of individual objectives for the successful implementation of all objectives. Without these preconditions (inputs), the desired outputs in the form of fuel and energy conservation are not feasible.

It is certainly not necessary to add that the effect of certain proposed measures, such as, for example, the utilization of waste heat from the compressor stations of the transit gas pipeline for vegetable production, may not be evaluated solely on the basis of fuel and energy conservation, but also in terms of the significance of this measure for an overall increase in our self-sufficiency in the supplying of basic types of vegetables, i.e., as a significant intensification factor, and even as an anti-import contribution.

Therefore the implementation of the proposed measures and planned conservation requires on the part of management workers at all levels of management in this sector the consistent monitoring of these problems, leadership toward the rational utilization of fuel and energy, and the maximum valuation of energy resources by all employees of our sector. Agricultural sectors are also focusing socialist competition and other forms of development of labor initiatives in the agro-foodstuff complex on these objectives.

From discussions at a conference prepared by the Agricultural Technology and Construction Department of the Czechoslovak Agricultural Academy in April 1980.

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